POPULATION CHANGE OF THE HANUMAN LANGUR (*PRESBYTIS ENTELLUS*), 1961-1976, IN DHARWAR AREA, INDIA

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(*With a text-figure*)

The population density and the group composition of the Hanuman langurs (*Presbytis entellus*) was studied at Dharwar, South India, in 1976. For the purpose of comparison with 1961 study of the same population, the present research was carried out in the same season using the same methods as used in 1961. The population decreased to 54.5% during these 15 years. The social characteristics of the species, however, did not change. Most of the bisexual troops have only 15-16 animals, including one adult male, each. Many males live out of the troops and gather to form all-male parties. These characteristics are revealed to be maintained not only by the high population density but also because they are the very basic characteristics of this species in this area.

INTRODUCTION

For thirty days between June 17 and September 26, 1961, Sugiyama took a census of the Hanuman langurs (*Presbytis entellus*) in Dharwar area of South India. The langurs observed had parts of their home ranges covering Dharwar-Haliyal road and its sides between the points 3 and 30.6 km from Dharwar. The census revealed the population density, group size and group composition of the langurs in this area, and was followed by sociological studies, for nearly two years, of the same species (Sugiyama 1964). Parthasarathy participated, for several days, in this census, and for a year and a half for the later sociological studies. Most of the troops (bisexual troops), each of which consisted of about 15 animals, had only one full-grown adult male in addition to several adult females and immatures, occasionally having a few young or subadult males. Other than such bisexual troops, there were parties (all-male parties) with a loose social organization. Troops had small moving ranges; average for a troop in the forest was 16.8 hectares. These ranges were maintained throughout the study period of two years through antagonistic relationships among adjacent troops. All-male parties, on the other hand, had larger moving ranges and were living mainly in a comparatively poorer habitat with a few trees and a little food. They frequently split into several still smaller parties which rejoined to form all-male parties again. Whenever the members of an all-male party approached a troop, the male of the troop became extremely aggressive toward them and chased them out of his troop's range, showing much stronger aggressiveness toward them than toward adjacent troops (Sugiyama, Yoshiba & Parthasarathy 1965). But, sometimes the party males counterattacked the troop male, ousted him from the troop, took control of the females, and succeeded in taking over the

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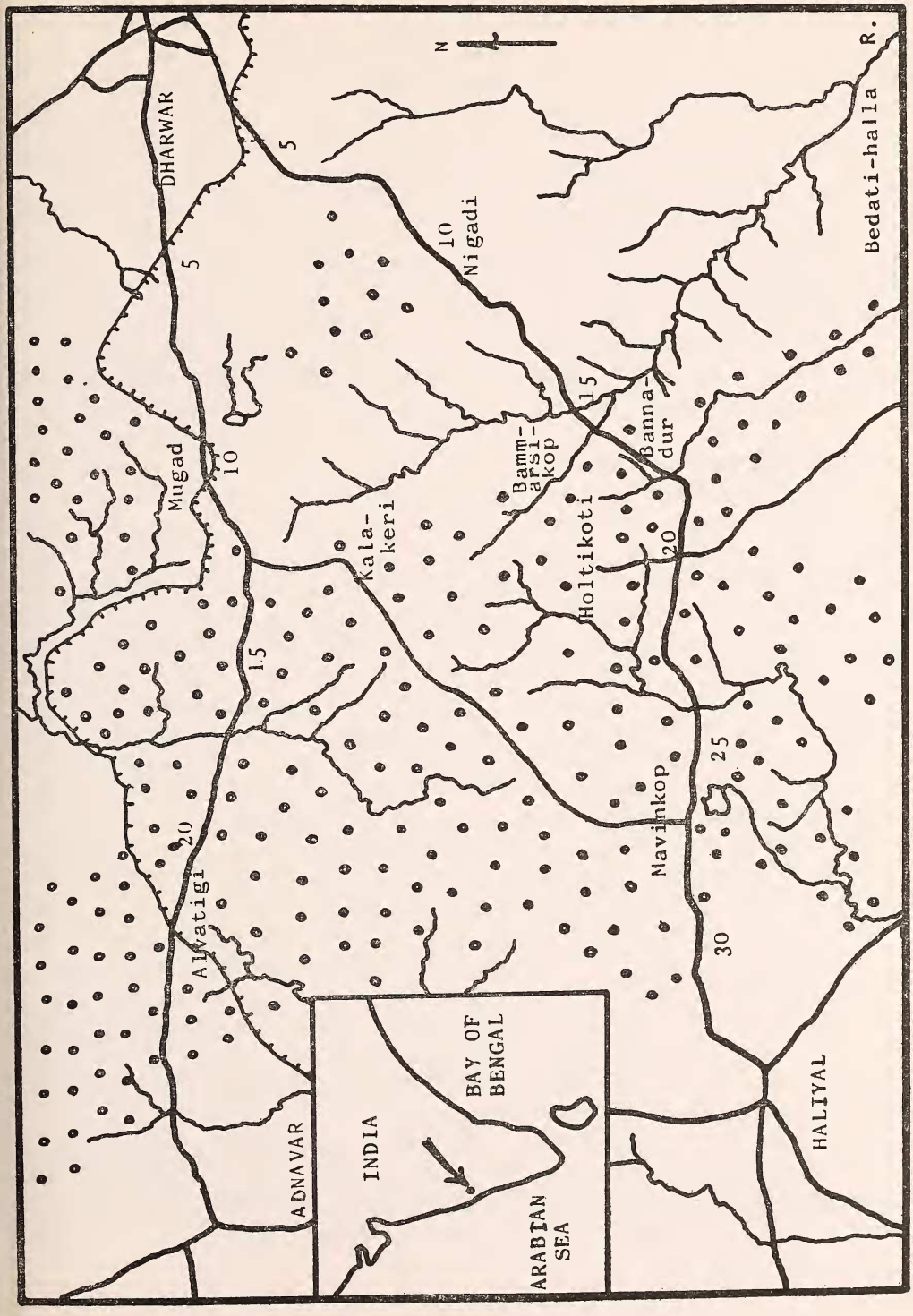

Fig. 1. Map of Dharwar. The forest part is shown by the small circles and the number under the road is the distance from Dharwar in kilometre.

moving range of the troop chasing out all the subadult and juvenile males and killing all the infants. Dispute followed even among party males and, as a result, only one male remained in the troop which had been taken over. Thus, finally, the typical one-male troop organization resulted. Troop males including subadults and the juveniles, who were ousted from the troop, might have joined a party or formed a party of themselves (Sugiyama 1965, 1966, 1976). Repeatedly undergoing this kind of social change, the particular type of social organization of the Hanuman langurs of Dharwar can be expected to be maintained for many years.

Mohnot (1971), Parthasarathy & Rahman (1974), Hrdy (1974, 1977), Ripley (personal communication) and the others confirmed a similar process of social change in different populations of this species living in different habitats of the Indian subcontinent and Sri Lanka (Ceylon). But there had been no evidence to confirm the fact that the maintaining mechanism of this particular type of one-male troop organization was not a temporary survival strategy in an especially severe environment and, thus, a confirmation of this hypothesis, by studying the same population of langurs some years after the first census was of utmost importance. To meet this objective, another census after a lapse of 15 years was taken.

Study period and method

The authors conducted the present census to estimate the population of the Hanuman langur in August 1976 using almost the same methods as used in 1961. They searched for langurs in areas extending upto 20 m on either side of Dharwar-Haliyal road between the points 3 and 29 km from Dharwar (Fig. 1). The data was collected by driving slowly repeatedly on the same section, in a three-wheel motor-cycle for 14 days from August 4 to 19. The census in 1961 had been taken between the points 3 and 30.6 km from Dharwar. But since the forest beyond the point 29 km from Dharwar had been changed into cultivated fields after 1961, the present census had to be terminated there. For the purpose of comparison with 1976 census, only the data between the points 3 and 29 km, of 1961 census will be presented in this article.

The total time of 30 days required for 1961 census was shortened to 14 days for the present study. One reason for doing so was that all the groups which had parts of their home ranges along the sides of the road could be confirmed much earlier in 1976 than in 1961, when all the groups were confirmed before the 20th day of observations. Secondly, the efficiency of searching for langurs was much greater in 1976 than in 1961. This is because in 1961 Sugiyama alone had to search for langurs, driving a jeep or a motorcycle by himself, whereas in 1976 both the present authors as well as the driver of the three-wheeler searched for the langurs. Moreover, the authors were more familiar with the area and had more research experience in 1976. Consequently, they were convinced that almost all the groups of langurs which had their moving ranges in the area under study had been recorded as precisely as in 1961 census (In 1961 and 1962 an intensive study in the sample area, following the census, revealed that 95% of the langurs who had their moving ranges on or along the road had been recorded during the census period).

The identification of the groups was done by the group size, its age-sex composition, and by identifying some characteristics typical of certain individuals in the group.

TABLE 1

GROUP DISTRIBUTION OF HANUMAN LANGURS AT DHARWAR

		1961 Census					1976 Census									
Distance from Dharwar	Field Condition	Troop or Party	Group Size	Adult ♂	Adult ♀	Juvenile and Infant	Troop or Party	Group Size	Full Ad-♂	Just Ad-♂	Full Ad-♀	Just Ad-♀	Senior Juvenile	Junior Juvenile	Infant (New Baby)	Remarks
3 km	Openland (Cultivated Field or Grassland)	T	10	1	6	3										
4		T	9	1	2	6										
5																
6		T	11	1	5	5										
7		P	9	6		3										
8		T	12	1	8	3										
9							T	2			1		1			Main part of
10		T	17	1	9	7	T	10	1		6	2	1			Troop 1 was not
11		T	19	1	13	5	T	12	1		6	2	2		1	found
12		T	21	5	8	8	T	26	1		13	2	4	4	2	
		P	10	8		2										
13		T	21	1	14	6										
14		T	19	1	9	9										
15		T	9	1	7	1										
		P	7	7			T	8	1		3	1	1		2(1)	
16		T	18	2	10	6	T	14	1		6	1	1	2	3	
17		T	23	1	10	12	T	16	1		8	1	2	2	2	
		T	22	6	7	9	T	27	1		12	1	4	4	5	
18		T	12	2	8	2	T	15	1		8	1	2	3		
		P	11	11			T	30	1		13	1	5	4	6	
19		T	11	2	6	3	T	17	1		6	1	4	3	2	
		T	16	1	8	7										
20		T	13	5	4	4	T	14	1		6	1	1	2	3	
		T	21	1	11	9	T	32	1		14	1	7	5	4	
		T	23	1	13	9	T	13	1		5		4	1	2(1)	
		T	20	1	8	11										
21	Forest	P	32	24		8	T	5			2	1	1	1		No ♂ of Troop
		T	12	1	6	5	P	15	7	3			2(♂)	3(♂) . .		15 was found*
		T	24	3	11	10										All ♂ Party A*
		T	16	1	13	2	T	14	1		7		1		5	
22		T	12	1	6	5										
		P	2	2												

23	T	11	1	9	1										
	T	12	1	7	4	T	16	1		8		1	2	4	
	T	11	1	5	5										
24	T	17	7	6	4	T	11	1	1	5	4				No ♂ of Troop 19 was found*
	T	9	1	6	2	T	6		1	2	1	1		1....	
	T	10	1	7	2										All ♂ Party B*
25	T	10	1	7	2	P	7	6	1						
	T	11	2	9		T	17	1	1	8	1	2	2	2	
26	T	19	4	9	6										
	T	11	1	6	4										
27															
28	T	11	1	5	5										
	T	15	1	7	7										
29	T	17	1	9	7										
Total		626	123	294	209		327	30	7	139	22	47	38	44(2)	

* Troop 15 and ♂ Party A, Troop 19 and ♂ Party B were sometimes found together.

CHANGES IN THE ENVIRONMENT

Though during these 15 years the cultivation extended slightly into the forest, yet the forest/openland ratio did not change much, at least between the points 3 and 29 km from Dharwar. Whole of the forest was covered with secondary dry deciduous forest dominated by planted teak (*Tectona grandis*). Trees in many parts of the forest had been cut and replanted and, at the same time, many new forests had appeared at the other parts. A whole deforestation did not proceed during the 15 years. For example, the northern part of the intensive study area of 1961-1963, between the points 21.5 and 23 km from Dharwar, was rather a matured teak forest and the southern part was an open scrub-forest about 2 years old after plantation (Sugiyama, Yoshiba and Parthasarathy 1965). The former was cut in 1965 or so, replanted, and was a young matured forest in 1976. The latter, on the other hand, was fully matured in 1976.

Significant change that could be noticed after 15 years was that the plantation of teak was being gradually replaced by that of eucalyptus (*Eucalyptus* sp.) which was not seen in 1961. Many small patches of eucalyptus trees could be seen in the census area in 1976. Teak flowers and young leaves were eaten by the langurs who also used teak trees for resting and sleeping. Rarely were they seen in eucalyptus trees.

RESULTS

During 1961 census 7.5 groups a day, on an average, had been discovered and the maximum number of groups discovered in a single day was 14. But in 1976 only 4.8 groups a day, on an average, were discovered and the maximum number of groups identified in a single day was 9. The total number of the groups

TABLE 2

COMPARATIVE DATA OF 1961 AND 1976 POPULATION CENSUS OF THE HANUMAN LANGURS ALONG DHARWAR-HALIYAL ROAD, BETWEEN THE POINTS 3 AND 29 KM FROM DHARWAR

	1961	1976	remarks
No. of Groups discovered per day	7.5	4.8	
Maximum No. of Groups discovered in a day	14	9	
No. of Groups living (Troops-Parties)*	43 (37-6)	22 (20-2)	
No. of langurs living (Troops-Parties)	626 (55-71)	327+x(305+x-22)	x is main part of Troop 1
No. of adult ♂ (Troops-Parties)	123 (58-65)	37 (20-17)	
No. of adult ♀	294	161	
Ad♂/Ad♀ ratio (Troop)	0.42 (0.20)	0.23 (0.13)	excluding Troop 1 (1976)
Mean Troop Size (Ad♂-Ad♀-Immatures)	15.0 (1.6-7.9-5.3)	16.0 (1.1-8.4-6.7)	excluding Troop 1 (1976)
Mean Party Size	11.8	11	
Roadside Density (Openland-Forest)	24.1 (13.4-34.8) head/km	13.1 (5.5-20.7) head/km	x of Troop 1 is calculated to be 14

* Troop = bisexual troop Party = all-male party

seen as many as 67 times during the census period of 1976 was confirmed to be 22 with 327 langurs. This is slightly more than half of 43 groups and 626 langurs confirmed in 1961 census.

The distribution, size and the age-sex composition of each group are shown in Table 1 and the comparative data of 1961 and 1976 census are shown in Table 2.

From August 13 to 15, at a point 9 km from Dharwar, an adult female and a senior juvenile were found in a tree. They did not move throughout these 3 days and kept looking in a certain direction. Since their behaviour was similar to that of typical stray animals, they were assumed to be a part of a troop, and were waiting in their familiar tree to join the main part of the troop that could never be traced during the census period. These two langurs were recorded as belonging to Troop 1 which has been excluded from certain data processings for this article.

No males were found in Troops 15 and 19. Also the numbers of adult females in these troops were extremely small. Due to the fact that these females were, sometimes, found mixing with all-male parties, they were taken as parts of two different bisexual troops from which adult males had already been ousted by all-male parties and, consequently, the females of the troops were scattering away or moving with the males who had been ousted. Although the exact evidence of social change could not be found, they have been treated

as two different troops.

All the troops except Troops 1, 15 and 19 were typical one-male troops, each with only one full-grown adult male. The number of adult males, including young adult males, per troops was 1.1 (Troops 15 and 19 included). This number is certainly smaller than that of 1961 census i.e., 1.6 males per troop. This means that "the matured troops" i.e., troops with more than one male each, were fewer in 1976 than in 1961. The same is true for party males. The average size and age-sex composition of a troop, however, did not differ much in the two studies. Population density, on the other hand, showed a considerable decrease; 41.4% in the openland (considering the unknown part of Troop 1 consisting of 14 animals) and 63% in the forest. In 1961, groups of langurs between the points 3 and 9 km from Dharwar and again between the points 12.5 and 15.5 km from Dharwar were frequently observed but in 1976 neither the langurs themselves nor the signs of their activity could be traced.

Discussion and conclusion

A. Population Density

It may be felt that the decrease in the population density of the Hanuman langurs, as shown by 1976 census, may be due to the short period during which the census was taken. But from the fact that in 1976 the authors used more efficient methods and that even then the average number of groups discovered in a day was only 64% of the average for a day in 1961 (refer Table 2), it can be said that the population density of langurs in 1976 was even lesser than 64% of that in 1961.

What reason can be attributed to this decrease? Increase of cultivated fields and the decrease of forest were not so large, at least between points 3 and 29 km from Dharwar. Therefore, the deforestation may not have had much significant effect on the population density. But replacement of teak plantations by eucalyptus may effect the environmental value for the langurs. This problem was not very serious at the time of the present study though it may become severe in the near future. Although no exact information on the trapping of langurs in Dharwar area could be obtained, there were reports that the activity of monkey catchers had increased tremendously throughout India during the 15 years and, thus, it is possible that even in Dharwar area some langurs had been captured. Even if the actual trapping of the langurs was little, the significant decrease i.e., 41.4%, of langur population in the cultivated fields (openland) shows an increased human impact on langurs as being responsible for this decrease. Despite the fact that there has not been much deforestation throwing of stones by villagers and attacks by domestic dogs has lowered the environmental value for the langurs and, consequently, their population density.

Siddiqi & Southwick (1977) found that a sample population of rhesus monkeys (*Macaca mulatta*) in Aligarh District of North India, declined to 51% during 12 years from 1962 to 1974. They emphasize that the main reason for this decline have been the increasing view of monkeys as agricultural pests, the loss of traditional protection given to rhesus monkeys by most of the people, the loss of jungle habitat through more intensive agriculture, and the commercial trapping of rhesus for export. Most of these reasons, except the last one, can be said responsible for the decrease of population density of langurs of Dharwar.

It is quite possible that further urbanization, increasing human population density and the transport facilities, and controlled plantations

into eucalyptus will further push down the population density of langurs in Dharwar as well as in other districts of the country.

B. Social Organisation

Although the langur population density had decreased to 54.5% (considering the unknown part of Troop 1 consisting of 14 animals) during the 15 years, the fact that the size of the troop, its age-sex composition and the frequency of the all-male party, and especially the one-male troop organization did not change should be emphasized. Sugiyama (1967) hypothesized that the maintaining mechanism of the particular one-male troop organization of the Hanuman langur over a long period has an adaptive value in controlling the population density as well as in maintaining the basic characteristic of this species. The 1976 census revealed that a decrease in the population density, even by one half, cannot change the frequency of rejuvenation of the troop and that this particular organization is a very basic characteristic of the Hanuman langur.

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References

Hrdy, S. B. (1974): Male-male competition and infanticide among the langurs (*Presbytis entellus*) of Abu, Rajasthan. *Folia Primat., 22*:19-58.

——— (1977): The langurs of Abu. Harvard University Press, Cambridge: pp. 361.

Mohnot, S. M. (1971): Some aspects of social changes and infant-killing in the Hanuman langur, *Presbytis entellus* (Primates: Cercopithecidae) in western India. *Mammalia, 35*:175-198.

Parthasarathy, M. D. & Rahman, H. (1974): Infant killing and dominance assertion among the Hanuman langur. *Abstracts of Vth Congr. Int. Primat. Soc.*: 35.

Siddiqi, M. F. & Southwick, C. H. (1977): Population trends and dynamics of rhesus monkeys in Aligarh District. In: Use of Non-Human Primates in Biomedical Research, Indian National Science Academy, New Delhi: 14-23.

Sugiyama, Y. (1964): Group composition, population density, and some sociological observations of Hanuman langurs (*Presbytis entellus*). *Primates, 5*(3-4):7-48.

——— (1965): On the social change of Hanuman langurs (*Presbytis entellus*) in their natural condition. *Primates, 6*(3-4):381-418.

——— (1966): An artificial social change in a Hanuman langur troop (*Presbytis entellus*). *Primates, 7*(1):41-72.

——— (1967): Social organization of Hanuman langurs, In: S. A. Altmann ed., Social Communication Among Primates, Univ. Chicago Press, Chicago: 221-236.

———, Yoshiba, K. & Parthasarathy, M. D. (1965): Home-range, mating season, male group, and inter-troop relations of Hanuman langurs (*Presbytis entellus*). *Primates, 6*(1):73-106.